

# MASTER OF ENGINEERING IN URBAN SYSTEMS ENGINEERING

## Curriculum

The Master of Engineering in Urban Systems Engineering program prepares students to design and maintain tomorrow's sustainable and resilient cities. The need for sustainable and resilient cities is greater than ever, with over two-thirds of the world's population projected to live in urban areas by 2050 and global urban cities facing myriad challenges in managing their transportation, energy, water, and waste systems. Engineers and city planners in both the public and private sector must approach cities as an integrated system of subsystems to efficiently manage and optimize resources.

To this end, the Master of Engineering in Urban Systems Engineering program integrates coursework in multiple engineering disciplines to prepare students with a deeper understanding of the intricacies of urban infrastructure systems and their interconnections and dependencies as they function as a system of systems. Students will learn how to design and manage urban infrastructure systems; how infrastructure engineering projects are planned, designed, funded, budgeted, and built; and how ever-increasing amounts of data can be used to design, operate, and understand more sustainable urban infrastructure systems.

The program combines: (1) fundamental courses in data analytics, systems analysis, and geographic information systems to understand how to approach cities as a system of systems, (2) breadth courses in areas of civil infrastructure systems, buildings and energy systems, environmental systems, and transportation systems to gain exposure to individual urban infrastructure subsystems, and (3) depth courses via technical electives in subsystem topic areas of interest.

Requirement	Credits
Minimum Credits Required	30
Maximum 400-Level Credit	9

Code	Title	Credit Hours
<b>Required Core Courses</b>		<b>(6)</b>
CAE 539	Introduction to Geographic Information Systems	3
CAE 575	Systems Analysis in Civil Engineering	3
<b>Data Analytics Requirement</b>		<b>(3)</b>
Select one course from the following:		3
CAE 523	Statistical Analysis of Engineering Data	3
CS 422	Data Mining	3
CS 584	Machine Learning	3
MATH 474	Probability and Statistics	3
MATH 564	Regression	3
MMAE 500	Data Driven Modeling	3
MMAE 501	Engineering Analysis I	3
STAT 514	Applied Computational Statistics for Analytics	3
<b>Civil Infrastructure Systems</b>		<b>(3)</b>
Select at least one course from the following:		3
CAE 437	Homeland Security Concerns in Engineering Systems	3
CAE 506	Building Envelope Rehabilitation	3
CAE 519	Structural Forensic Engineering	3
CAE 561	Structural Reliability and Probabilistic Bases of Design	3
CAE 569	Construction Methods, Cost Estimating, and Project Budgeting	3
CAE 570	Legal Issues in Civil Engineering	3
CAE 572	Construction Business Operations and Cost Accounting & Control	3
CAE 573	Construction Management with Building Information Modeling	3
CAE 574	Economic Decision Analysis in Civil Engineering	3
CAE 576	Applications of Unmanned Aerial Vehicles (UAVs or "Drones") for Construction Projects	3
CAE 579	Real Estate Fundamentals for Engineers and Architects	3
<b>Buildings and Energy Systems</b>		<b>(3)</b>

Select at least one course from the following:			3
CAE 513	Building Science		3
CAE 515	Building Energy Modeling		3
CAE 517	HVAC Systems Design		3
or CAE 464	HVAC Systems Design		
CAE 526	Energy Conservation in Buildings		3
or CAE 465	Energy Conservation in Buildings		
CAE 538	Control of Building Environmental Systems		3
CAE 550	Applied Building Energy Modeling		3
CAE 552	Introduction to Sustainable Building Design		3
CAE 556	Net Zero Energy Building Design I		3
CAE 557	Net Zero Energy Building Design II		3
CHE 541	Renewable Energy Technologies		3
CHE 543	Energy, Environment, and Economics		3
ECE 580	Elements of Sustainable Energy		3
ECE 581	Elements of Smart Grid		3
MMAE 522	Nuclear, Fossil-Fuel, and Sustainable Energy Systems		3
<b>Environmental Systems</b>			<b>(3)</b>
Select at least one course from the following:			3
CAE 401	Hydraulics, Hydrology, and Their Applications		3
CAE 584	Stormwater Management		3
ENVE 401	Introduction to Water Resources Engineering		3
ENVE 402	Introduction to Environmental Engineering and Sustainable Design		3
ENVE 404	Water and Wastewater Engineering		3
ENVE 463	Introduction to Air Pollution Control		3
ENVE 501	Environmental Chemistry		3
ENVE 506	Chemodynamics		3
ENVE 503	Occupational and Environmental Health and Safety		3
or ENVE 403	Occupational and Environmental Health and Safety		
ENVE 522	Global Environmental Change and Sustainability Analysis		3
or ENVE 422	Global Environmental Change and Sustainability Analysis		
ENVE 523	Geoenvironmental Engineering		3
or ENVE 423	Geoenvironmental Engineering		
ENVE 528	Modeling of Environmental Systems		3
ENVE 542	Physicochemical Processes in Environmental Engineering		3
ENVE 543	Carbon Capture, Utilization, and Storage		3
or ENVE 444	Carbon Capture, Utilization, and Storage		
ENVE 576	Indoor Air Pollution		3
ENVE 580	Hazardous Waste Engineering		3
<b>Transportation Systems</b>			<b>(3)</b>
Select at least one course from the following:			3
CAE 419	Introduction to Transportation Engineering and Design		3
CAE 543	Demand Models for Urban Transportation		3
CAE 544	Urban Transportation Planning		4
CAE 545	Traffic Operations and Flow Theory		3
CAE 546	Public Transportation Systems		3
CAE 547	Advanced Traffic Engineering		3
CAE 548	Transportation Systems Management		3
CAE 549	Transportation Economics, Development and Policy		3
CAE 568	Transportation Asset Management		3
CAE 580	Intelligent Transportation Systems		3
<b>General Electives</b>			<b>(9)</b>

Select elective courses in areas of interest relevant to urban systems engineering	9
<b>Total Credit Hours</b>	<b>30</b>

Up to 12 credit hours of 400-level courses can be applied to the program.

A maximum of 4 credit hours of 597 Special Problems can be applied to the degree program.